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ABSTRACT

The relationship between diversity in the contents of preschool children's lunchboxes, food waste, and other variables was investigated among 32 children in a rural day care center located in a university community. Lunchbox contents and food waste were observed on five occasions for each child. Data were gathered on 10 variables (such as age of child, mother's work status, person packing the lunch, and the child's eating patterns) by questionnaire in interview sessions with the parent who packed the child's lunchbox. A diversity score for each child was obtained by counting the total number of different food items and calculating the mean for five observations. A waste score was computed by counting the total number of portions left over, with double weight given to main entrees, and dividing the sum by the total number of food items for all observations. In this study, parental consent was not obtained prior to observation because parent knowledge could have influenced normal lunch packing. Results are discussed. (RH)

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DIETARY DIVERSITY AND FOOD WASTE IN A RURAL CONNECTICUT DAYCARE

by

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PURPOSE OF THE STUDY

This study investigates the dietary diversity of lunchbox contents and subsequent food waste of 32 preschoolers in a daycare located in central Connecticut.

The objectives of the study were to:

1) measure the variation in dietary diversity and food waste in the sample

2) to uncover interrelationships between these variables and other demographic factors

One hypothesis is that dietary diversity is inversely related to food waste: as a child's diversity score increases, his or her waste score decreases.

BACKGROUND THEORY

The theoretical underpinnings are that a more diverse or complex diet is positively related to nutritional quality. In nutrition, this concept can be traced to the nutritional adage that one should "eat as wide a variety of foods as possible." The relationship between dietary diversity and nutritional adequacy has been tested by several researchers (Burke and Allen, 1977; Sanjur, Cravioto and VanVeen, 1970; Dewey, 1980; DeWalt and Pelto, 1977; Cattle, 1976). Methods for scoring diversity vary from a straight numerical counting of food items to more elaborate computations that measure representation within food or nutrient categories. In this study, a straight numerical counting of different food items within a lunchbox defines dietary diversity. The exact methodology for this and other variables will be described.

In anthropology, the concept of dietary diversity is framed in terms of resource exploitation, with three possible levels of subsistence strategy available: herbivory, carnivory, and omnivory. Omnivorous animals have the most complex diet because they consume both plant and animal foods. An omnivorous diet is more likely to provide the spectrum of nutrients that are necessary for optimal health than a diet that is solely vegetarian or meat based. Theoretically, groups of animals who are omnivorous have an evolutionary advantage over groups that have a more restricted resource base, if an environmental shift should require dietary adaptation (Ritenbaugh, 1979; Yesner, 1980; Newman, 1980; Cassidy, 1980). One ecological anthropologist has framed this concept in a contemporary mode by stating that "perhaps one of man's greatest achievements is that he can eat fresh strawberries for dessert at Christmas dinner while a blizzard rages outside." (Cohen, 1974).

However, one must make a distinction here between grower and consumer: in nutritional terms, the increasing diversity in diet that strawberries in winter provide may benefit those least in need. Several studies have shown that cash crop economies leave the producers with inadequate resources to buy a diverse diet (Dewey, 1980; DeWalt and Pelto, 1977).

METHODS AND PROCEDURES

A period of observational time in the daycare and at lunchtime preceded the design of the study. In addition, an unstructured and lengthy interview with a mother of one of the children was done.

Table I lists the total number of variables. The two that were measured in the daycare were lunchbox contents and food waste, observed on five occasions. I had on any one day to record 12 children. The data were

TABLE I

VARIABLE DEFINITIONS

Variable:		
1. Diversity Score	-	interval level - straight numerical counting - average of 5 days of food items for the full five day period; condiments (jelly, ketsup) and beverages not counted; highest value = highest complexity
2. Waste Score	-	interval level - portions left over, with double weight for main entrees, e.g., sandwiches; 5 day score divided by total number of food items; lowest value = least waste
3. Age		
4. Mother's Workstatus	-	1 = works as homemaker 2 = works part-time 3 = works full-time
5. Identification of Lunchpacker	-	1 = mother 2 = father 3 = both, in turns
6. Child's Eating Pattern	-	1 = picky 2 = mediocre 3 = good
7. Nutrition Knowledge Score	-	1 = lowest 10 = highest
8. Nutrition Knowledge Source	-	1 = newspaper, magazines, 2 = course and reading 3 = talking with professionals (doctors, nutritionists, etc.)
9. Food Preparation Enjoyment Score	-	1 = lowest 10 = highest
10. Marital Status	-	1 = two parent household 2 = single parent household

collected by using an index card for each child, as shown in Table 2.

TABLE II

METHOD FOR RECORDING DAYCARE MEASURES

Child's Name Lunchbox Contents	Date Portion of each Item Uneaten
1/2 peanut butter sandwich w/w bread	1/4
1 apple	1/2
2 wheat crackers	--
1 oatmeal cookie	--
milk	

As each opened his or her lunchbox, I quickly recorded the portions and contents, often eliciting help from the child if a food's identity was not obvious. As a child began to pack up after consumption, I tabulated the foods and portions that were left. In this example, the slashed lines indicate complete consumption for the crackers and the cookie. Only 1/4 of the 1/2 sandwich, and 1/2 of the apple were consumed. The beverages proved hard to measure, because thermoses opened at irregular times and I found my tabulation of amounts to be too inaccurate for inclusion and interpretation. Also, some of the children were on free milk programs and others were not. For these reasons the beverages are not accounted for in the final tabulations.

The scores for diversity and food waste were computed after the five observations were completed. As seen in Table I, the diversity score was obtained by counting the total number of different food items and finding the mean for 5 observations. The highest value reflects the highest diversity. The range for this variable is from 28 to 74. The waste score was computed by counting the total number of portions left over, with double weight for main entrees, and dividing this number by the total number of food items for all observations. The lowest value reflects

the least waste. The range for this variable is from 0 (no waste) to 99.

The remaining variables were obtained by a questionnaire through an interview with the lunchpacker parent. (Appendix I).

These data were collected after the daycare measures were completed, so that prior knowledge of the study by the parents would not influence normal lunchpacking patterns.

THE RESEARCH SITE AND SAMPLE

The research site was a rural daycare located in a university community in central Connecticut. This daycare is not subsidized and high tuition costs preclude low income families from enrolling their children. The population, therefore, is quite homogeneous socioeconomically. Educational backgrounds of the parents is also very high, further biasing the sample.

Thirty-two children were selected by myself based on their availability. Those children who attended the daycare only once or twice a week were excluded from the study. Data were collected within two separate time periods: the first subsample of 22 children in the Fall of 1980; the second subsample of 14 children in the Spring of 1982.

Parental consent was not obtained because this would have interfered with the goals of the study. Rather, blanket consent was given by the director of the daycare. When parents were notified of the study and asked to answer the questionnaire, they were given the choice of participating or withdrawing. All of the parents agree to participate.

This procedure is clearly inappropriate and unethical for most research setups. However, my own children were enrolled in the daycare and I was therefore friendly with the parents of the children in my sample. This

enabled me to collect the daycare measures without parental knowledge and subsequent hostility. In any future studies, parental consent would have to be given prior to data collection. In order to avoid interference with normal lunchpacking patterns, a dummy goal for the study would need to be proposed. For example, the researcher could state that the purpose of the study is to measure child and teacher interaction during lunchtime.

The sample of 32 children included 13 boys and 19 girls. They ranged in age from 18 months to 5 years. In the daycare, there are two groups of children categorized by age: The Snuggler-Hugglers, who are 4 and 5, and the Wild-One's, who range in age from 18 months to 3 years. These two groups are physically separated for parts of the day, lunchtime being one of them.

Of the 31 mothers in the sample, 65% worked full-time, 26% worked part-time, and 10 did not work outside of the home. Of the 32 families, 81% were two parent households, and 19% were single parent households. Only 1 of these single parents was a male.

All but one of the parents had educational experience beyond high school, and more than half had graduate education. All but one of the households was Caucasian, with the exception of a Black household.

STATISTICAL PROCEDURES AND RESULTS

All of the variables were coded for the appropriate statistical procedure. The Statistical Analysis Systems computerized package was used for analysis.

Results of bivariate analysis of this data set can be seen in Table III.

The relationship between dietary diversity and food waste was examined. The correlation coefficient is -0.31, $p<0.08$. In this case, I am taking

TABLE III

BIVARIATE ANALYSIS OF SELECTED VARIABLES

Variables	Pearson or Spearman Coefficient	P
Dietary diversity and food waste	-0.31 (Pearson)	<0.008
Child's Home Eating Pattern and Daycare Food Waste Score	-0.50 (Spearman)	<0.006
Mother's Work Status and Daycare Food Waste Score	-0.52 (Spearman)	<0.005
Marital Status and Dietary Diversity Score	0.40 (Spearman)	0.03
Food Preparation Enjoyment Score and Dietary Diversity Score	0.30 (Spearman)	<0.1
Age of Child and Food Waste	-0.57 (Spearman)	<0.001

an alpha level of .1 because I am concerned about a Type II error. The relationship between dietary diversity and waste is an inverse one as hypothesized, although it is not as strong as I would have liked. It is possible that by redefining dietary diversity, better results could be obtained. For example, scoring diversity based on a lunchbox contents representation within food groups may more truly reflect variety.

The lunchpackers perception of her child's home eating habits is positively related to her child's daycare waste score. The Spearman correlation coefficient for this matrix is -0.5, $p<0.006$. What this means is that the children in this sample tend to eat in the daycare as the lunchpacker perceives them to eat at home. This result clearly validates my measure of waste, as well as the lunchpacker's ability to assess his or her child's eating patterns. If this relationship did not occur in this data set, there would have been three alternative explanations for the lack of association: 1) my measure for waste was valid; 2) children tend to eat differently away from home; 3) the lunchpacker did not correctly evaluate his or her child's home eating patterns.

A mother who works full-time is more likely to have a child with a lower waste score. The Spearman correlation coefficient for this bivariate analysis is -0.52, $p<0.005$. I do not have a ready explanation for this result. There are several possibilities: 1) working mothers more accurately judge their child's capacity and adjust for volume in lunchbox contents; 2) in families with working mothers there is more "food talk" about not wasting food 3) children with working mothers tend to be older and age is related to waste.

A two-parent household is more likely to have a higher diversity score than a single parent household. The Spearman correlation coefficient is 0.40, $p<0.03$. Of the six single parent households, none had a high diversity score,

when diversity was coded into 2 or 3 categories. This result may reflect the high degree of stress and lack of a support system within single parent households.

There is a positive relationship between food preparation enjoyment and dietary diversity. A Spearman correlation coefficient is 0.3, $p<0.1$. I had hypothesized this relationship on the basis that more enjoyment of food preparation would result in more interesting lunchbox contents.

There is a strong relationship between the age of a child and his or her food waste score. Spearman correlation coefficient = -0.57, $p<0.001$. The older the child, the less waste.

A stepwise multiple regression procedure was done to generate a model that would explain the variation in the variable food waste. The independent variables were 1) dietary diversity; 2) food preparation enjoyment; 3) child's home eating patterns; 4) self perceived nutrition knowledge; 5) mother's workstatus; 6) age of child; 7) marital status. A "Maximum R" option was chosen to achieve the maximum R-square improvement. Results of the regression procedure can be seen in Table IV.

The total R-square is .71. Age is the first variable entered, explaining 34% of the variation in food waste. The older the child, the less food waste. This is a not surprising, but reassuring result, to both mothers and nutrition educators alike.

The second variable entered is the child's home eating patterns. The mother was asked to rate her child's home eating behavior. The pickier home eaters also have the highest waste scores, while the best home eaters, as perceived by mothers, have the least waste, as measured by myself in the daycare. This result clearly validates my measure of waste, and

TABLE IV

STEP-WISE REGRESSION MODEL

DEPENDENT VARIABLE = WASTE SCORE

TOTAL R^2 = .71

STEP 1	AGE	R^2 = 0.34	$p < .001$
STEP 2	CHILD'S HOME EATING PATTERNS	R^2 = 0.52	$p < .0001$
STEP 3	MOTHER'S WORK STATUS	R^2 = 0.65	$p < .0001$
STEP 4	DIETARY DIVERSITY SCORE	R^2 = 0.71	$p < .0001$

confirms that the child's eating patterns in this sample do not vary.

The third variable entered in the stepwise multiple regression is the mother's workstatus, with full time working mothers having children with the lowest waste scores. The forth variable entered is the dietary diversity score, which does not contribute very much to the model.

Those independent variables that did not contribute to the model are marital status, self-perceived nutrition knowledge, and food preparation enjoyment score.

One likely problem with this model is that there is co-linearity between some of the variables. For example, age of the child probably predicts mother's work status, so that there are more older children (who tend to waste less food) in the group of mothers who work full-time. This gives an artificially high R-square. Performing a factor analysis before the regression procedure would solve this problem, but in this data set there are not enough variables to collapse into new factors.

Another problem is that some of the variables have been coded ordinally that are only marginally acceptable as ordinal level measures. An example is child's home eating patterns, with: 1 = picky eater 2 = medium eater 3 = good eater. This is an ordered scale, but there is no way of validating equal distance between the steps. Use of a hedonic scale would preclude this problem in the future.

SUMMARY AND CONCLUSIONS

I consider this study to be a good pilot. In terms of operationalizing concepts and variables, the results were successful. I feel that the measure for waste has been validated, and the hypothesis that there is an

inverse relationship between dietary diversity and lunchbox waste is supported.

This study cannot be generalized to the larger population of daycare preschoolers. The sample is too small and far too homogeneous to be representative. It may well be representative of a university community, but that is a rather narrow and select population.

In any future studies, several daycare populations should be included. The sample should reflect variation in income, ethnicity, geographical location, education, and so forth.

Nutrition educators have come to believe that nutrition education should begin in the very early years. More studies need to be done to investigate the eating patterns and food knowledge of young children. To this end, I hope this paper makes a contribution.

QUESTIONS FOR PARENTS

APPENDIX I

1. Names: Father
Mother
Single parent?
Other children:

2. Occupation: Father
Mother (how long, full-time/)

3. Ethnic Classification if any:
Father:
Mother:

4. Level of education (Last year of school completed)
Father:
Mother:

5. Who packs the lunch?

6. Do you feel your child is a picky, medium, or good eater generally?

7. Are there any foods your child does not like to eat?

8. How would you rate yourself on a scale of 1-10 in terms of nutritional knowledge?

9. What is the source of your nutritional knowledge?

10. Would you like to increase your nutritional knowledge?

11. On a scale of 1-10, how would you rate your interest or enjoyment in food preparation?

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